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ABSTRACT

The Wechsler Intelligence Scale for Children--Revised (WISC-R) Freedom from Distractibility (FFD) factor and other neurocognitive measures were examined as to their discriminative validity in diagnosing children with Attention Deficit Disorder/Hyperactivity (ADD/H), ADD/H children with concurrent Conduct Disorder, and children comprising a clinic control population. While the Verbal-Comprehension and Perceptual-Organizational factors significantly distinguished between clinic groups, the FFD factor did not. A predictive discriminate analysis revealed very low hit rates using the WISC-R factors, but, using a battery of selected neurocognitive measures of attention, memory, self-regulation, and speed of cognitive processing, good group discrimination was achieved. These results argue against using the WISC-R FFD factor in differential diagnosis of neuropsychiatric disorders and suggests that other combinations of neuropsychological measures provide better indices for distinguishing clinic groups of ADD/H children. (Author)

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DISCRIMINATE VALIDITY OF NEUROCOGNITIVE MEASURES IN DIAGNOSING CHILDREN WITH ATTENTION DEFICIT DISORDER/HYPERACTIVITY*

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Abstract - The WISC-R Freedom from Distractibility (FFD) factor and other neurocognitive measures were examined as to their discriminative validity in diagnosing children with Attention Deficit Disorder/Hyperactivity (ADD/H), ADD/H with concurrent Conduct Disorder, and those comprising a clinic control population. While the Verbal-Comprehension and Perceptual-Organizational factors significantly distinguished between clinic groups, the FFD factor did not. A predictive discriminate analysis revealed very low hit rates using the WISC-R factors, but, using a battery of selected neurocognitive measures of attention, memory, self-regulation, and speed of cognitive processing, good group discrimination was achieved. These results argue against using the WISC-R FFD factor in differential diagnosis of neuropsychiatric disorders and suggests other combinations of neuropsychological measures provide best indices for distinguishing clinic groups of ADD/H children.

Children diagnosed as having attention deficit disorder-hyperactivity (ADD/H) are characterized as inattentive, impulsive, and lacking in motor inhibition (APA, 1980). The neurological basis of ADD/H is difficult to articulate. Zametkin and Rapaport (1986) note 11 different neuroanatomically based theories in their review. These various formulations include Laufer and Denhoff's (1957) ideas about dysfunctional diencephalic (thalamus, hypothalamus) structures, Wender's (1974) implication of decreased RAS excitation, Dykman, Ackerman, Clements, and Peters (1971) theory regarding a deficient forebrain inhibitory system, and, more recently, Lou, Henriksen, and Bruhn's (1984) rCBF/CT study which implicated the dopaminergic neural network originating in the mesencephalon and passing through the central frontal regions to the prefrontal cortex. It is this latter system that is important in inhibition and particularly in the regulation of attention (Drewe, 1975; Fuster, 1980) and is most likely involved in reactivation by methylphenidate. Consequently, this neuroanatomical perspective suggests that behavioral-neuropsychological studies of children with ADD/H would document deficient attentional, inhibition, and memory systems in these children.

The "freedom from distractibility" (FFD) factor on the WISC-R has been demonstrated to be a robust factor across development (Groff & Hubble, 1982; Kaufman, 1975; Sattler, 1982) and, as suggested by Ownby and Matthews (1985) may be useful diagnostically with children suspected of having severe learning and behavioral problems. The study by Ownby and Matthews (1985) found significant relationships between the Arithmetic, Coding, and Digit Span subtests which comprise the FFD factor and Trails A and B, the Knox Cube Test, and timed cognitive tasks. They concluded that this factor may be sensitive to children's "executive" processes and thus, may have potential value in differential diagnosis. Considering the behavioral manifestations of ADD/H, it seems that this factor may have particular relevance in differential diagnoses of children with attentional dysfunction. However, multivariate studies have shown the FFD factor to be comprised of many complex abilities including components assessing achievement, anticipation/rehearsal, and memory (Stewart & Moely, 1983). Therefore, the differential diagnosis utilizing the FFD factor may not be as clearcut as previously believed.

The purpose of this study was twofold. First, it was of interest to examine whether the FFD factor differentiated between children with ADD/H, co-occurring conduct disorder and ADD/H (presumably a more severe form of ADD/H according to Lahey, Green, & Forehand, 1980; Rutter, 1983), and a clinic control population of children with internalizing disorders (e.g., depression, dysthymic disorders). A second component was to assess the relative discriminate validity of a selected battery of measures of attention, vigilance, memory, and speed of cognitive processing in distinguishing between these clinic populations.

METHOD

Subjects

Subjects were 53 children referred to a university-based outpatient diagnostic and referral center which serves children aged 6-13 years in a southeastern state of the United States. The 53 children in the present study were taken from 112 referrals to the center over a three-year period (1984-87) and fell into three DSM III diagnostic groups: depressive disorder, conduct disorder co-occurring with ADD/H, and ADD/H.

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Measures

In addition to the WISC-R, all children received a comprehensive neuropsychological examination which included the Luria-Nebraska Neuropsychological Battery-Children's Revision (LNNB-CR), simple and complex (same/different discrimination between nonsense trigram pairs) reaction time, and other measures of achievement. For the second part of the analysis, the three subtests of the WISC-R factor, simple and complex reaction time measures (time), and the rhythm and memory scales of the LNNB-CR were included in a predictive discriminate analysis.

RESULTS AND DISCUSSION

Analysis of variance revealed that significant differences existed between the groups on the Verbal Comprehension factor ($F = 6.32$, $p < .004$), Perceptual Organizational factor ($F = 3.66$, $p < .01$), but not on the FFD factor ($F = 1.14$, $p > .05$). Of interest and consistent with those who argue that ADD/H with co-occurring conduct disorder represents a more severe manifestation of this disorder (Lahey et al., 1980; Quay, 1987), it was this group that performed significantly poorer on the Verbal Comprehension and Perceptual Organization factors. Their performance was, on the average, one standard deviation below that of the children diagnosed as having an internalizing disorder (clinic control) or ADD/H as a sole diagnosis. Thus, the first analysis reveals that the FFD factor does not distinguish between children with diagnosed attentional problems and other clinic referred children. This supports the conclusions of Stewart and Moely (1983), and Ownby and Matthews (1985) who suggest that this third factor is a complex one assessing very divergent components of cognitive and executive processes but also argues that it cannot be used diagnostically in differentiating between clinic groups such as the ones employed here. In fact, a follow-up discriminate analysis using all three of these factors revealed poor classification rates when all three factors were employed (hit rates of 50%, 35.7%, and 61.9% for the clinic control, ADD/H, and ADD/H with co-occurring conduct disorder, respectively).

However, when the three subtests comprising the third factor (presumably assessing more discrete memory and attentional processes than provided by the factor score) were employed with the LNNB-CR memory and rhythm scales, and simple and complex reaction time measures were employed in the predictive discriminate analysis, much better results were found. Since these variables may assess deficient attentional/regulatory and memory processes better than the third factor in isolation, it is noteworthy that the hit rates in group discrimination improved significantly. This discriminate analysis resulted in correct classification rates of 75%, 63.6%, and 69.2% for the clinic control, ADD/H, and ADD/H children with co-occurring conduct disorder.

The results of this study suggest several conclusions. First, it is apparent that significant cognitive deficits characterize those children who are diagnosed as having ADD/H in the presence of conduct disorder. This may argue that ADD/H in isolation is a less severe form of this disorder since it is known that conduct disordered children with ADD/H have a significantly greater incidence of delinquency (Quay, 1987; Walker, Lahey, Hynd, & Frame, 1987). Second, while deficits in Verbal Comprehension and Perceptual Organization characterize this latter group, the FFD factor does not, thus arguing that the third factor is not useful in isolation in differential diagnosis. Third, a predictive discriminate analysis using the factor scores reveals poor discrimination among these groups with only have of the ADD/H children being correctly identified. Fourth, and the major finding of this study, is that when a battery of measures which assess attentional/regulatory processes, memory, and speed of cognitive processing are employed, significantly greater hit rates are obtained. This suggests that such measures as employed here have clinical-diagnostic utility in assisting in the differential diagnosis of children with ADD/H, ADD/H with co-occurring conduct disorder and a sample of clinic control children with internalizing disorders. Finally, these results suggest that the neuropsychological test battery when employed in the differential diagnosis of children with psychiatric disorders should include a wide range of measures assessing memory, speed of cognitive processing, attention and self-regulation if differential diagnosis is to be achieved. This is consistent with Luria's (1980) conceptualization and argues against using standardized neuropsychological test batteries for children that assess poorly the constructs of attention and self-regulation important in the neuropsychiatric diagnosis with children (Hynd, Snow, & Becker, 1986).

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